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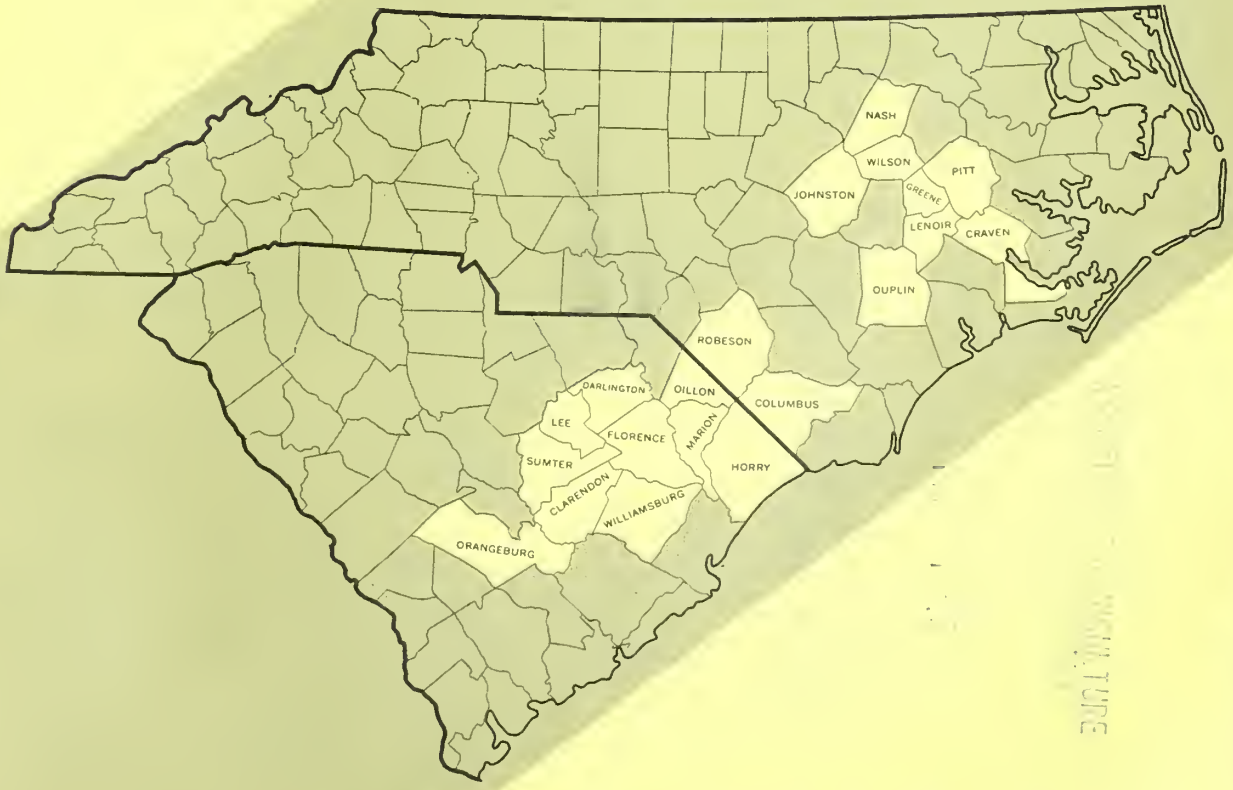
SERVICE REPORT 115

MARKET POTENTIAL FOR COOPERATIVE L P GAS SERVICES in the carolinas



BY JOHN M. BAILEY

Farmer Cooperative Service
U.S. Department of Agriculture
Washington, D.C. 20250
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FARMER COOPERATIVE SERVICE
U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C. 20250

Farmer Cooperative Service strengthens the economic position of farmers and other rural people by improving organization, development, management, and operation of their cooperatives. It works directly with cooperative leaders and Federal and State agencies on cooperative problems. It publishes research results and educational materials and issues the News for Farmer Cooperatives.

The Service helps (1) farmers and other rural residents get better prices for products they sell and obtain supplies and services at lower cost; (2) rural residents use cooperatives to develop and make effective use of their resources; (3) cooperatives improve their services and operate more efficiently; (4) members, directors, employees, and the public to better understand how cooperatives work and benefit their members and their communities; and (5) encourage international cooperative programs.

CONTENTS

Page

Summary..... 1

State trends in use..... 1

Crop drying uses..... 6
Fuel-drying by farmers..... 6
Proportion farm-dried by LP gas..... 6

Broiler house and other farm uses..... 6

Household use - farm and non-farm..... 8

Estimated LP gas use - 1969..... 8
Tobacco drying..... 8
Peanut and corn drying..... 11
Broiler house heating..... 13
Household use..... 13
Total use..... 17

Estimated LP gas use - 1980..... 18
Tobacco drying..... 18
Peanut and corn drying..... 20
Broiler house heating..... 23
Household use - farm and non-farm..... 23
Total use..... 24
Possible new uses..... 24

Appendix - Information sources..... 26

SUMMARY

The purpose of this study was to determine the feasibility of cooperative distribution of liquefied petroleum (LP) gas in the Carolinas.

Our analysis shows a sufficient market to warrant their involvement both at present and in the future.

The potential LP gas market in 1969 for North Carolina was 145 million gallons and for South Carolina, 58 million gallons. The estimated potential for 1980 is 202 million and 73 million gallons for the respective States.

Farm use represented a little over half the potential in North Carolina but only 14 percent of the total in South Carolina last year.

The principal farm production use of LP gas was for curing tobacco; heating broiler houses was the next largest use.

In 1969 use of gas for curing tobacco in North Carolina was estimated at 56 million gallons, with a 93.5 million gallon projection for 1980. For broilers the estimate came to 11 million for 1969 and the projection for 1980 to 19 million gallons. The total estimate for all crop drying and broiler uses was 75.1 million gallons in 1969, with a projection of 121.5 million gallons for 1980.

The farm use estimate for South Carolina was 8 million gallons for 1969, with a 16-million gallon projection for 1980.

The use estimates for tobacco were derived from a combination of production figures and proportions of crop cured with LP gas. The proportion figures for different years are value judgements based on surveys made by Statistical Reporting Service of the United States Department of Agriculture in 1966, the University of North Carolina in 1967, and the Planning and Economic Research Department of FCX, Raleigh, North Carolina in 1970.

The 1966 and 1967 studies indicated a 3 percent annual increase in the proportion of the crop cured with LP gas. The 1970 survey indicated an intent of farmers to continue changing to greater use of LP gas for curing tobacco.

Of 73 farmers not using LP gas in 1969 -- some 38 percent of a sample of 198 tobacco growers -- 20 producers planned to use LP gas within three years. These 20 plus the 125 present users would total 145, or 73 percent of the sample using LP gas. Fourteen farmers currently using LP gas for curing planned to increase its use within three years.

A reasoned estimate of the proportion of tobacco cured in 1969 with LP gas was 46 percent and the proportion is expected to increase to 70 percent by 1980.

Household use of LP gas provides a good market potential, especially in the non-farm area. The total household use estimate in North Carolina for 1969 was 70 million, with 80 million gallons, projected for 1980. For South Carolina household use came to an estimated 49 million for 1969 and a projected 57 million gallons for 1980.

(*_____*)

MARKET POTENTIAL FOR COOPERATIVE LP GAS SERVICES IN THE CAROLINAS

by John M. Bailey
Farm Supplies Division

Liquefied petroleum gas (butane and propane) has become an important fuel in the last 20 years.

The national use has increased almost ten-fold and farm consumption, including production and household uses, has increased about four times in this period.

In both North and South Carolina, the most important farm use of LP gas was for curing tobacco. A significant shift to LP gas from fuel oil for curing has occurred in recent years. In many areas, the use of LP gas for heating broiler houses also has increased rapidly.

Little data are available on the quantities of LP gas used for various purposes both by farmers and non-farmers in these States. Leaders of cooperatives requested Farmer Cooperative Service (FCS) to develop information on the market potential for this fuel and project anticipated uses by 1980.

Sources of data for developing the various estimates in this report are included in the Appendix.

STATE TRENDS IN USE

The national use of LP gas increased from 1.3 billion gallons in 1945 to 12.9 billion gallons in 1965, 1/ almost a ten-fold increase. In agriculture, consumption rose from 508 million gallons in 1949 2/ to 1,317 million gallons in 1959 3/, and to an estimated 2,137 million gallons in 1966 4/. Farm consumption, including production and household uses, thus increased about four times from 1949 to 1966.

As to agricultural use in the Carolinas, very little information was available except for the few reports of the Economic Research Service (ERS) and the 1964 Census of Agriculture.

The National LP Gas Association publishes yearly figures of volume by several categories of use -- as obtained from reports of cooperating distributors, but they do not show agricultural use separately. For example, in 1966 its use categories were residential-commercial, internal combustion, industrial, utility gas, and all other uses. The latter use had a volume of about 17 million gallons which included all agricultural uses except gas used in internal combustion engines.

1/ LP Gas Industry Market Facts, NLPGA, 1966 P. 11.
2/ Farm Consumption of Liquefied Petroleum Gases, FM 87, USDA, 1951.
3/ Liquefied Petroleum Fuel Used by Farmers in 1959, Stat. Bul. 344, ERS, USDA.
4/ Unpublished data - ERS, USDA.

The ERS survey in 1966 for North Carolina showed some 43 million gallons of LP gas used only for crop drying on the farm. To this could be added at least 8 million gallons for heating broiler houses. This gave a total of 50 million gallons in contrast to the 17 million gallon figure of the National LP Gas Association.

The 1964 Census and the National LP Gas Association figures showed a similar disparity. The Census indicated farmers bought for production purposes about 30 million gallons of LP gas while the Association reported "all other uses", including agricultural uses, was around 14 million gallons that year.

The trends in farm production use for North and South Carolina from 1959 to 1964 based upon expenditures shown in the Census of Agriculture are indicated in the following tabulation.

State	Used in Farm Production	
	1959 1/	1964 2/
	Gallons (millions)	
North Carolina	12.6	29.6
South Carolina	3.9	10.1

1/ Unpublished State data, Stat. Bul. 344, ERS-USDA, 1964.
2/ Based on conversion from dollar amounts in 1964 Census at 18.5 cents per gallon for North Carolina and 17.9 cents per gallon for South Carolina.

In addition to gas used in production, farm households use it for cooking, heating homes, and water heating. In 1959 household use was reported at 8 million gallons and 7 million gallons respectively for North and South Carolina. The 1964 Agricultural Census had no information on farm household use.

The extent to which farmers used LP gas in specific years and the prices they paid is indicated in Table 1. Less than a third of the farms in North Carolina used LP gas during the 1963-69 period. For South Carolina, a few more than a third were users in the same period.

Prices paid in South Carolina since the first 2 years have generally been about 1 cent a gallon higher than North Carolina.

The 1964 Census of Agriculture provided county information on farm production expenditures for LP gas. In North Carolina, 10 counties accounted for 44 percent of total LP gas expenditures. For South Carolina, the 10 counties with highest expenditures represented 80 percent of the State total.

Figure 1 shows the 10 counties in each State with the highest LP gas expenditures and the proportion of State totals for each of the counties. In both States, the counties with highest expenditures are located in heavy tobacco producing areas.

Support data for Figure 1 are in Table 2. The highest 10 counties in North Carolina had purchases of $2.4 million compared to over $1.4 million for the 10 highest in South Carolina.

Table 1.--Number and proportion of farms using LP gas and prices paid, North and South Carolina, 1963-1969 1/

Years	North Carolina: Number of farms in State	North Carolina: Number of farms using LP gas	North Carolina: Percent of farms using LP gas	North Carolina: Prices paid per gallon	South Carolina: Number of farms in State	South Carolina: Number of farms using LP gas	South Carolina: Percent of farms using LP gas	South Carolina: Prices paid per gallon
	1,000	1,000	Percent	Cents	1,000	1,000	Percent	Cents
1963	189	52	28	20.9	72	20	28	19.5
1964	180	53	29	18.5	67	22	33	17.9
1965	175	55	31	17.0	65	22	34	18.1
1966	170	57	34	17.5	62	23	37	18.5
1967	168	47	28	18.0	58	20	34	19.0
1968	165	46	28	17.8	55	20	36	19.3
1969	161	46	29	18.4	53	18	34	19.5
(est.) 1970	157	--	--	--	51	--	--	--

1/ Data -- Annual Agricultural Prices, USDA and State Statistical Reports.

Figure 1.--Ten counties with highest LP gas purchases, Carolinas, 1964.

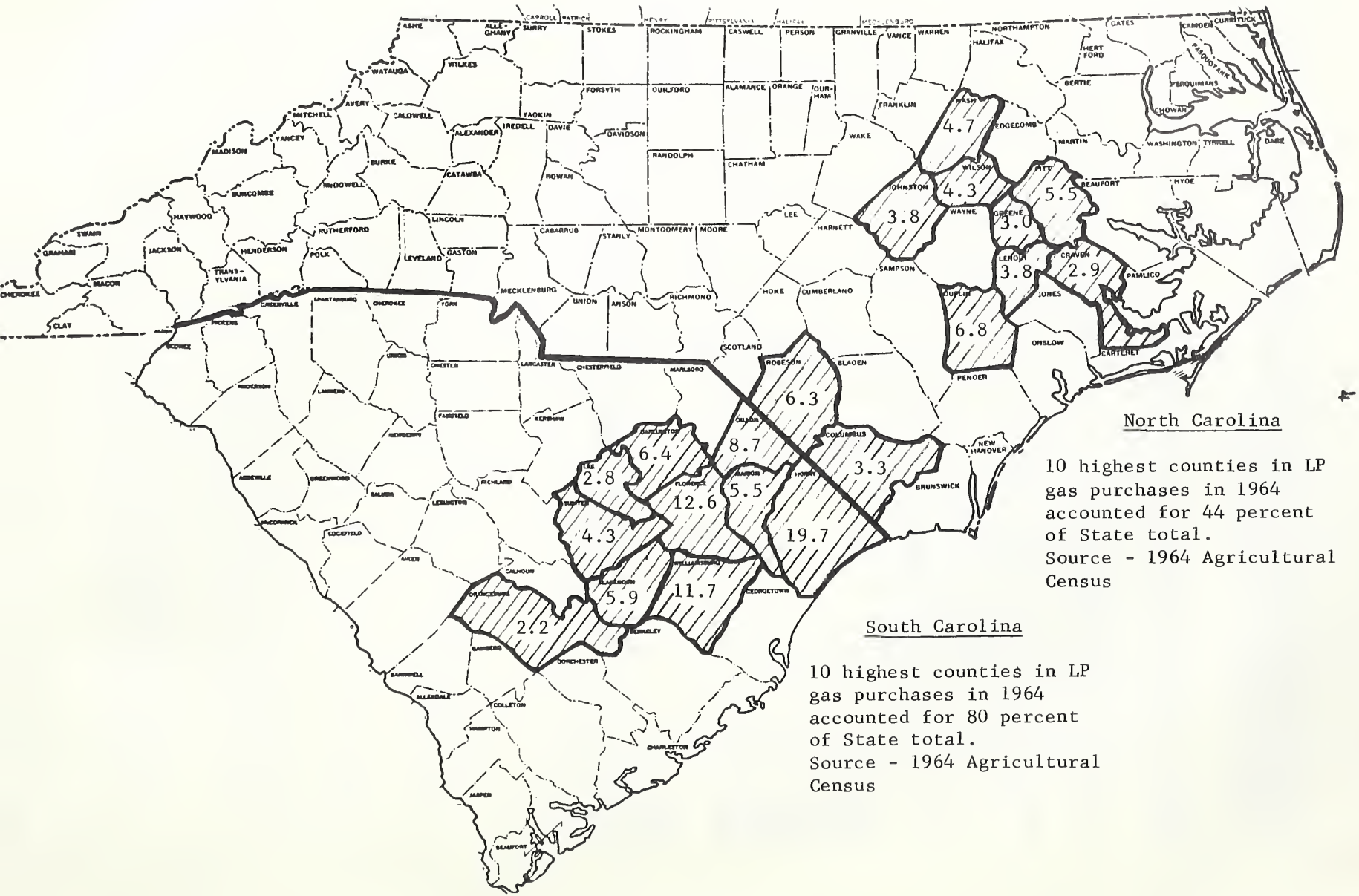

Table 2.--LP gas purchases by farmers for production use in dollars and as percentage of State totals for 10 counties with highest purchases in North and South Carolina, 1964.

Counties with highest purchases : County	Expenditures for LP gas : $1,000	Percent of State total : Percent
North Carolina		
Duplin	369	6.8
Robeson	346	6.4
Pitt	301	5.5
Nash	257	4.7
Wilson	237	4.3
Johnston	208	3.8
Lenoir	208	3.8
Columbus	181	3.3
Greene	161	3.0
Craven	156	2.9
10-county total	2,424	44.5
State total	5,450	100.0
South Carolina		
Horry	356	19.7
Florence	228	12.6
Williamsburg	212	11.8
Dillion	158	8.8
Darlington	116	6.4
Clarendon	106	5.9
Marion	100	5.5
Sumter	78	4.3
Lee	51	2.8
Orangeburg	40	2.2
10-county total	1,445	80.0
State total	1,806	100.0

CROP DRYING USES

The use of LP gas for crop drying in 1966 is indicated in Table 3. In both States tobacco is the predominant crop using LP gas -- accounting for about 90 percent of the total LP gas used for drying. For North Carolina, tobacco curing accounted for 38 million gallons of a total drying use of 43 million gallons.

The amount of LP gas used for drying on farms is dependent upon several factors: (1) Proportion of total crop dried; (2) amount dried by farmers; (3) number of farmers using LP gas rather than another fuel; and (4) relative advantages of LP gas over other fuels.

Fuel-Drying By Farmers

Farmers do all the drying or curing of tobacco where heat is applied. In 1966, North Carolina farmers dried 69 percent of their crop with fuel compared to 45 percent in South Carolina, according to an ERS-SRS survey.

In that year, about half the peanuts in North Carolina were farm dried with fuel compared with only 10 percent in South Carolina. Corn and soybean crops had lesser proportions of fuel-drying on the farm and accounted for only a small part of this fuel.

Proportion Farm-Dried by LP Gas

In North Carolina about 32 percent of the tobacco curing was done by LP gas, in South Carolina about 29 percent. Peanuts dried with LP gas amounted to about 80 percent of the total in both States.

Farmers are still shifting to LP gas for tobacco curing. This shift is reported to be due to some of the following circumstances:

1. Less constant attention during curing period.
2. High cost of replacing fuel oil pot burners.
3. No electricity required for LP gas burners.
4. Relative costs of LP gas and other liquid petroleums.

BROILER HOUSE AND OTHER FARM USES

Heat for broiler houses in North Carolina is next in importance to tobacco curing as a use of LP gas on the farm. Costs and returns data of the University of North Carolina indicate that one gallon of LP gas is used for each 20 birds, with about 75 percent of production heated with gas. Total use is in direct relation to total production.

Layer, turkey, and pig brooders use only small amounts of LP gas.

Very little LP gas is reported used as fuel for tractors and other motors on farms.

Table 3.--Estimated data for farm consumption of LP gas for drying selected crops, North and South Carolina, 1966. 1/

Crop	Total Production	Proportion dried on farms	Quantity dried on farms	Proportion dried with LP gas	Quantity dried with LP gas	Drying rate per gallon LP gas	LP gas used
	Mil. lbs.	Percent 2/	Mil. lbs.	Percent 2/	Mil. lbs.	Lbs.	Mil. gal.
North Carolina							
Tobacco	779.3	69	537.7	32	169.0	4.4	38.4
Peanuts	400.8	49	197.2	78	153.8	40.6	3.8
	Mil. bu.		Mil. bu.		Mil. bu.	Bu.	
Corn	60.3	18	10.6	60	6.4	6.2	1.0
Total							43.2
	Mil. lbs.	Percent 2/	Mil. lbs.	Percent 2/	Mil. lbs.	Lbs.	Mil. gal.
South Carolina							
Tobacco	127.3	45	57.2	29	16.5	5.0	3.3
Peanuts	18.1	10	1.9	84	1.6	49.3	0.0
	Mil. bu.		Mil. bu.		Mil. bu.	Bu.	
Corn	14.5	13	1.9	72	1.4	6.4	0.2
Total							3.5

1/ Stat. Bul. No. 439 - ERS/SRS - USDA, 1969.
2/ Some derived and rounded.

Household Use-Farm and Non-Farm

National use of Lp gas for residential and commercial purposes rose from 3.9 billion gallons in 1959 to 5.7 billion gallons in 1966--an increase of 46 percent according to annual statistics published by the National LP Gas Association.

Its use nationally continued and reached 6.7 billion gallons in 1968, an increase of 17.5 percent in the two-year period. However, the consumption of gas for residential and commercial uses in North Carolina dropped from 131.5 million gallons in 1966 to 124.8 million gallons in 1967 and to 123.4 million gallons in 1968.

The figures do not provide a breakdown between residential and commercial uses nor do they give any clues about urban as compared by rural or farm uses.

The Bureau of Mines lists the following uses of gas for residential purposes: Kitchen ranges, barbecue grills, water heaters, clothes dryers, central heating systems, central air conditioning, space heaters, patio and yard lamps, patio and pool deck heaters, and for recreation equipment such as camp cookers, heaters, lights, and refrigeration. Thus the household category includes a wide variety of uses -- all applicable for farm homes.

Household use of LP gas is reported by the American Gas Association to average 108 gallons a year for cooking and 250 gallons a year for water heating. Use for home heating may average about 1,000 gallons a year in North Carolina and somewhat less in South Carolina.

ESTIMATED LP GAS USE -- 1969

We estimated the use of LP gas in farm operations and for all types of households, both farm and non-farm, in the Carolinas during 1969. Actual data were not available. Because these estimates were based on a large number of factors, the methodology and sources of data will first be outlined for each use.

Tobacco Drying

Crop production figures for 1969 were those reported in January 1970 by the North and South Carolina State Departments of Agriculture.

The 1966 ERS report on LP gas used for drying provided basic data from which to consider recent changes in the use of gas. Inasmuch as opinion varies in North Carolina concerning the past and present extent of gas use for curing tobacco, a recent survey by the Market Research Department of FCX provides support for current and projected uses.

This survey covered 198 tobacco farmers in three possible distribution areas in North Carolina. It was designed primarily to determine the extent of the use of LP gas for curing tobacco and the intent of farmers to increase the use of or change to LP gas for curing tobacco.

Inasmuch as the total use of LP gas in South Carolina is significantly less than for North Carolina, estimates for South Carolina will be tied to bases used for North Carolina.

In each of the three selected areas in North Carolina, there was a wide difference between and within surveys in the proportion of volume of tobacco cured with LP gas and also in proportion of farmers using LP gas for curing. For Area I, the proportion of volume cured by gas was 63 percent in Pitt and 25 percent in Wilson. Of farmers interviewed in Pitt 64 percent used LP gas for curing compared to 34 percent in Wilson (Table 4). In Areas II and III the situations were similar.

In total, for 4,525,498 pounds of tobacco produced by 198 farmers surveyed, 51 percent of the volume was cured with LP gas and 60 percent of the farmers used LP gas for curing.

The survey results indicate that the proportion cured by gas is less than the proportion of farmers using gas for curing. This seems logical because of the physical nature of the factors involved and the practical nature of farmers not to make changes without experimentation.

The survey showed the historical trend of shifting to LP gas for curing tobacco and also indicated a continuance of the trend. The significant and difficult decision is projecting the extent and timing of the trend.

As mentioned, the ERS survey in 1966 showed 32 percent of the quantity cured with fuel in North Carolina was cured with LP gas. Data from a 1967 unpublished study at North Carolina State University indicated 35 percent of the tobacco produced in a 14-county area was cured with LP gas. The area studied in 1967 included the area currently surveyed by FCX.

A projection, using a 3 percent yearly increase in the proportion cured between 1966 and 1967, to 1969 would suggest about 41 percent being cured with LP gas in 1969 compared to 51 percent indicated in the FCX survey.

In looking at market potential, the future is more optimistic using 41 percent currently cured with LP gas with 59 percent remaining. Conversely, if 51 percent is currently cured with LP gas, the remaining potential is 49 percent; and this is a more conservative view. Rather than use two sets of figures reflecting optimistic and conservative potentials, the midpoint of 46 percent was used for the 1969 proportion in this report.

Table 4.--Summary of FCX survey showing volume and proportion of tobacco cured with LP gas and number and proportion of farmers using LP gas for tobacco curing for selected areas of North Carolina, 1969.

Area and County or Community	Tobacco			Farmers		
	Total Tobacco cured	Amount cured with LP gas	Proportion cured with LP gas	Number of tobacco farmers surveyed	Number using LP gas for curing	Proportion using LP gas for curing
	Pounds	Pounds	Percent	Number	Number	Percent
Area I						
Pitt	835,212	525,172	63	33	21	64
Wilson	1,696,600	421,300	25	50	17	34
Area total	2,531,812	946,472	37	83	38	46
Area II						
Mt. Olive	364,000	212,400	58	22	19	86
Sampson	220,600	82,200	37	17	8	47
Area total	584,600	294,600	50	39	27	69
Area III						
Fairmont	1,176,086	966,800	82	39	38	97
Pembroke	233,000	84,150	36	37	16	43
Area total	1,409,086	1,050,950	75	76	54	71
Total	4,525,498	2,292,022	51	198	119	60

On the basis of this information, the amount of LP gas used in curing tobacco in 1969 in North Carolina was 56 million gallons on 280 million pounds (Table 5). For South Carolina use was 7.1 million gallons on 35.3 million pounds.

Peanut and Corn Drying

LP gas is used to dry crops other than tobacco. In both States farmers use gas to dry peanuts and corn.

Peanut Use.--Peanuts are next to tobacco in crops using LP gas in North Carolina, but they use only about 10 percent as much as that required for tobacco. This use in South Carolina is very small.

On the assumption that 80 percent of the peanuts were dried on farms and that 95 percent was dried with LP gas, a total of 6.4 million gallons of LP gas was used in North Carolina and 0.3 million gallons were used in South Carolina in 1969 (Table 5).

Corn Use.--Use of LP gas for corn is relatively unimportant in the Carolinas, although it ranks ahead of peanuts in South Carolina.

Only 10 to 12 percent was dried on farms in 1969 and 95 percent of this quantity was dried with LP gas. An estimated 1.7 million gallons of gas was used in drying 10.8 million bushels of corn in North Carolina and 0.3 million gallons was used on 1.8 million bushels in South Carolina in 1969 (Table 5).

Table 5.--Estimated farm consumption of LP gas for drying tobacco, peanuts, and corn in North and South Carolina, 1969.

Crops	Total production	Proportion dried on farms	Quantity farm dried	Proportion dried with LP gas	Quantity dried with LP gas	Drying rate per gallon: LP gas	LP gas used
	Mil. lbs.	Percent	Mil. lbs.	Percent	Mil. lbs.	Pounds	Mil. gal.
North Carolina							
Tobacco	716.0	85	608.0	46	280.0	5.0	56.0
Peanuts	342.0	80	273.6	95	259.9	40.6	6.4
	Mil. bus.		Mil. bus.		Mil. bus.	Bushels	
Corn	90.0	12.5	11.4	95	10.8	6.2	1.7
Total							64.1
	Mil. lbs.	Percent	Mil. lbs.	Percent	Mil. lbs.	Pounds	Mil. gal.
South Carolina							
Tobacco	137.0	60	82.2	43	35.3	5.0	7.1
Peanuts	21.0	80	16.8	95	16.0	49.3	0.3
	Mil. bus.		Mil.bus.		Mil. bus.	Bushels	
Corn	19.0	10	1.9	95	1.8	6.4	0.3
Total							7.7

Broiler House Heating

Broiler producers were heavy users of LP gas. Broiler production in North Carolina is concentrated in a few counties.

The five counties of North Carolina with the greatest production of broilers in 1964 are indicated below.

County	Number of broilers (Mil. birds)	Percent of State production
Wilkes	29.5	13.8
Chatham	24.3	11.4
Duplin	22.3	10.5
Moore	19.3	9.1
Randolph	13.9	6.5
Total	109.3	51.3
State total	213.2	100.0

Those counties accounted for 51.3 percent of North Carolina production. Only Duplin county was in the area of highest tobacco production.

Based on the previously mentioned ratio of 1 gallon for 20 broilers with 75 percent of production being heated with LP gas, the production of 289 million broilers in North Carolina suggests an LP gas use of just over 11 million gallons for 1969. Broiler production in South Carolina of 20 million birds would require no more than 750,000 gallons of LP gas.

Household Use -- Farm and Non-Farm

LP gas is used in households for cooking and for heating houses and water. It is used in both farm and non-farm households.

North Carolina.--The total population of North Carolina in 1969 was reported at nearly 2 million persons by the North Carolina Department of Agriculture. Using the 1960 ratio of population distribution as a base, the urban and rural 1969 ratio was considered as 40 and 60 percent, respectively.

The distribution of rural population between farm and non-farm was based on data from the Research Triangle Institute (RTI) of Research Triangle Park, North Carolina. In sharp contrast to the 1960 Census rural distribution of about 30 percent farm and 70 percent non-farm, the ratio for 1969 was 15 percent farm and 85 percent rural non-farm.

RTI estimates place the rural household breakdown in 1969 at 119,000 farm homes and 666,000 rural non-farm homes for a total of 785,000.

The number of urban households in 1969 (calculated from a 1960 base) is estimated to be 590,000.

With the number of households determined, the proportion of each group using LP gas for specific uses, as reported in the 1960 Census of Housing, is applied. The following tabulation indicates the proportion of households in North Carolina using LP gas for specific purposes.

Type of household	Proportion using LP gas			
	Water heating	Cooking	Home heating	Total
	Percent			
Farm	2.9	15.7	2.2	20.8
Rural non-farm	3.3	16.1	3.0	22.4
Urban	4.4	12.1	2.3	18.8

The figures show that the proportion using LP gas is greatest for cooking, varying from 12.1 percent for urban homes to 16.1 percent for rural non-farm homes. In total, the proportion of households using LP gas was 18.8 percent for urban, 22.4 percent for rural non-farm, and 20.8 percent for farms. Thus, about one of five households in the general population used LP gas.

Recent research by RTI showed 19.1 percent of rural households reported expenditures for LP or natural gas in 1969, a slightly lower proportion than in 1960.

By area, the proportion ranged from a high of 39.1 percent in the Coastal plains to a low of 7.3 percent in the mountains -- with the Piedmont showing 10.1 percent, based on a sample of 1,170 rural homes.

Based on these reported figures, household use is calculated in Table 6.

The total household use of LP gas in 1969 is calculated to be 5.5 million gallons for farm homes, 37.0 million gallons for rural non-farm homes, and 27.8 million gallons for urban homes, for a total of 70.3 million gallons.

South Carolina.--The information on household use of LP gas in South Carolina is shown in Table 7. The distribution of estimated population by households to the farm, non-farm rural, and urban sectors is made on the basis of the 1960 figures. Home heat for a year is estimated to require 900 gallons of LP gas. The proportion of each segment -- farm, non-farm rural, and urban -- that used LP gas for each of the three household uses is also based on the 1960 Census.

For farm households the total usage was 4.5 million gallons of LP gas,

Table 6.--Household use of LP gas in farm, rural non-farm and urban households, three uses, North Carolina, 1969.

Item	Use Categories: Water heating	Cooking	Home heating	Total
Farm Use				
		Percent		
Proportion using (1960 base) in 1969	2.9	15.7	2.2	20.8 1/
		Number		
Number of farm households using LP gas (State total 119,000)	3,451.0	18,683.0	2,618.0	24,752.0
		Gallons		
Average gallons for each use	250.0	108.0	1,000.0	--
		Million Gallons		
Total gallons used	0.86	2.02	2.62	5.50
Rural Non-Farm Use				
		Percent		
Proportion using LP gas (1960 base)	3.3	16.1	3.0	22.4
		Number		
Number of rural non-farm households using LP gas (State total 666,000)	21,978.0	107,226.0	19,980.0	149,184.0
		Gallons		
Average gallons for each use	250.0	108.0	1,000.0	--
		Million Gallons		
Total gallons used	5.49	11.58	19.98	37.05
Urban Use				
		Percent		
Proportion using LP gas (1960 base)	4.4	12.1	2.3	18.8
		Number		
Number of urban homes using LP gas (State total 590,000)	25,960.0	71,390.0	13,570.0	110,920.0
		Gallons		
Average gallons for each use	250.0	108.0	1,000.0	--
		Million Gallons		
Total gallons used	6.49	7.71	13.57	27.77
All Uses				
Total for State	12.84	21.31	36.17	70.32

1/ A household may use gas for one or more purposes, so this percentage as added across may be high to the extent that households have more than one use for gas.

for rural non-farm households 28.3 million; and for urban households 16.6 million gallons. These figures meant a State total of 49.4. million gallons of LP gas used in households.

Table 7.--Household use of LP gas in farm, rural non-farm and urban households, three uses, South Carolina, 1969.

Item	Use Categories: Water heating	Cooking	Home heating	Total
Farm Households				
		Percent		
Proportion using (1960 base)	3.4	12.9	5.6	21.9
		Number		
Number of farm households using (State total 61,084)	2,077.0	7,880.0	3,421.0	13,378.0
		Gallons		
Average usage	250.0	108.0	900.0	--
		Million Gallons		
Total gallons	0.52	0.85	3.08	4.45
Non-Farm Rural Households				
		Percent		
Proportion using (1960 base)	3.9	13.8	6.4	24.1
		Number		
Number of households using State total (343,600)	13,400.0	47,417.0	21,990.0	82,807.0
		Gallons		
Average usage	250.0	108.0	900.0	--
		Million Gallons		
Total usage	3.35	5.2	19.79	28.34
Urban Households				
		Percent		
Proportion using (1960 base)	4.0	10.1	4.0	18.1
		Number		
Number of households using State total (291,215)	11,649.0	29,413.0	11,649.0	52,711.0
		Gallons		
Average usage	250.0	108.0	900.0	--
		Million Gallons		
Total usage	2.91	3.18	10.48	16.57
All Uses				
Total for State	6.78	9.23	33.35	49.36

Total Use

Total use of LP gas in North Carolina in 1969 was 145.4 million gallons -- consisting of 75.1 million gallons in farm production operations and 70.3 million gallons in households of both farm and non-farm types (table 12).

South Carolina used an estimated 57.7 million gallons with 8.4 million in farm production and 49.3 million gallons in households.

ESTIMATED LP GAS USE - 1980

A view of production trends in recent years and estimates for 1980 for North and South Carolina appear in Table 10. A summary of estimated consumption of LP gas for curing and drying tobacco, peanuts, and corn crops in North and South Carolina for 1980 appear in Table 11. Also included are estimates on the proportion dried on the farm with LP gas, drying rates per gallon of gas, and total gallons used.

Tobacco Drying

The 1980 production estimates were calculated from a February 1970 ERS projected national figure of 1,670 million pounds. This assumed both North Carolina and South Carolina would maintain their relative share of national production, namely 40 percent for North Carolina and 8 percent for South Carolina.

A production of 668 million pounds for North Carolina is fairly close to a current consensus of tobacco specialists at North Carolina State University. The 134 million pound figure for South Carolina in 1980 is lower than a Clemson University projection for 1980 made from 1965-66 long-range, more optimistic, estimates of the United States Department of Agriculture.

There was general agreement in North Carolina that the swing to bulk barns by 1980 may be as much as 10 percent with most bulk barns using LP gas. This factor would not markedly affect the proportion cured with gas.

The extent of use of LP gas for curing tobacco by 1980 will depend on many factors such as its price in relation to prices of fuel oil and natural gas, wider availability of natural gas, acceptance of bulk curing, labor supply, efforts of fuel oil distributors to maintain their share of the curing market, and unforeseen changes in technology. Inasmuch as information was lacking that could be specifically related to the above factors for projection purposes, the assumption was made for a continuation of trend without specific influence of any of the above mentioned or other factors.

An indication of the trend in the acceptance of LP gas for tobacco curing is evident by the number of years that farmers have used LP gas. The current FCX survey of 198 tobacco farmers (Table 8) showed that of 115 farmers responding to the question, 30 -- or 26 percent -- had used LP gas from 1 to 3 years; 54 farmers -- or 47 percent had used it from 4 to 6 years; 21 -- or 18 percent -- had used it for 7 to 10 years; and 10 farmers -- or 9 percent -- had used LP gas for more than 10 years to cure tobacco.

While almost half of the 115 farmers had been using LP gas from 4 to 6 years, the fact that 26 percent had begun to use it within the last three years is evidence that the switch to gas is still continuing. The information that 34 farmers out of 198 -- about 17 percent -- planned

to change to LP gas or increase their use of it also substantiates a continued trend to greater use of LP gas.

Table 8.--Farmers reporting use of LP gas by number of years, 3 areas, North Carolina, 1969.

Area and county or community	Number of Farmers Reporting	Years they used LP gas			
		1-3	4-6	7-10	over 10
Area I					
Pitt	23	3	18	1	1
Wilson	16	4	6	3	3
Area II					
Mt. Olive	18	8	8	1	1
Sampson	9	6	2	-	1
Area III					
Fairmont	36	6	14	13	3
Pembroke	13	3	6	3	1
Total	115	30	54	21	10
Percent		26	47	18	9

Table 9 shows that 73 farmers of the 198 surveyed were not using LP gas for curing. Thirty-four farmers indicated they were considering a change to, or a greater use of, LP gas within three years. Of these, 20 planned to begin using gas and 14 already using gas planned to increase their use of it.

The 20 farmers who plan to change to LP gas represent about 27 percent of the 73 farmers not presently using gas. This is a rather strong indication of change to gas and suggests that within three years the number of farmers in the survey using gas could be 145 out of 198, or about 73 percent. By years, 13 farmers considered changing in 1 year, 10 within 2 years, and 11 within 3 years.

An optimistic view of potential by 1980 could hold that the areas where the proportion of farmers using gas is near 90 percent and the volume being cured with gas is near 60 percent or above, its use would continue to increase and reach a level of 85 percent of total production cured by gas.

Table 9.--Farmers not using LP gas for curing, and number of farmers reporting intentions to change to LP gas or to increase use of it, 1969.

Area	Number of farmers in survey not using LP gas for curing	Number of farmers to increase use or change to LP gas	Number to increase or change to LP gas in next 1 yr.	2 yr.	3 yr.
Area I					
Pitt	7	7	2	3	2
Wilson	33	6	2	1	3
Area II					
Mt. Olive	3	5	4	1	-
Sampson	8	7	2	3	2
Area III					
Fairmont	2	2	0	0	2
Pembroke	20	7	3	2	2
Total	73	34	13	10	11

With the same optimism, it could be forecast that the areas with a considerably lower level of use (averaging 41 percent of farmers using gas and 33 percent of production cured with gas) could, within a 10-year period, reach a level where 70 percent of their production would be cured. These optimistic views thus suggest between 70 and 85 percent of production could be cured with LP gas by 1980.

A conservative position would be that it is unlikely for the proportion of production cured to go much beyond 80 percent. If the 3 areas now averaging 33 percent of production cured with gas increased at a 3 percent rate a year, as was done between 1966 and 1967, only about 60 percent of production would be cured with LP gas by 1980.

Thus four options are present to help in selecting the proportion of tobacco that may be cured with LP gas in 1980 -- those within the optimistic ranges of 70 to 85 percent and the conservative ranges of 60 to 80 percent. A projection of 70 percent is selected as a reasonable goal and could be reached with a yearly increase of less than 3 percent.

Estimates based on the foregoing information indicate that 93.5 million gallons of LP gas may be used in curing tobacco in North Carolina in 1980. The estimate for South Carolina is 13.1 million gallons (Table 11).

Peanut and Corn Drying

As with tobacco, a greater use of LP gas to dry peanuts and corn is projected for 1980.

Peanut Use

Consensus for 1980 in North Carolina suggests that 80 percent of the peanuts produced will be dried on the farm and that 95 percent will be dried by gas. A slight increase in production to 360 million pounds for 1980 in North Carolina was anticipated. A larger increase was figured for South Carolina to 28 million pounds but this was not significant in the total use of gas.

Estimates indicate a use of 6.7 million gallons in North Carolina and 0.4 million gallons in South Carolina for drying peanuts in 1980 (table 11).

Table 10.--Production trends for tobacco, peanuts, corn and broilers for selected year, North and South Carolina.

Crop and State	1960-64 avg.	1966	1969	1980 (estimate)
		Million pounds		
Tobacco				
N. C.	913.1	779.3	716.1	668
S. C.	161.6	127.3	136.7	134
Peanuts				
N. C.	320.4	400.8	342.3	360
S. C.	12.7	18.1	21.1	28
		Million bushels		
Corn				
N. C.	75.8	60.3	89.8	100
S. C.	18.8	14.5	18.9	40
		Million birds		
Broilers				
N. C.	213.2	265.0	289.2	407
S. C.	17.1	17.5	20.0	30

Corn Use

A decrease in production of late corn varieties and a corresponding increase of midseason varieties is projected for 1980. More of this corn will require heat-drying but over 50 percent expected to be dried commercially. This amount added to the early crop which will be mostly dried commercially meant that about 15 percent of total production in North Carolina and 18 percent in South Carolina would be dried on the farms. About 95 percent of on-farm drying will be done with LP gas.

Table 11.--Estimated farm consumption of LP gas for drying tobacco, peanuts, and corn in North and South Carolina in 1980.

Crops	Total production	Proportion dried on farms	Quantity farm dried	Proportion dried with LP gas	Quantity dried with LP gas	Drying rate per gallon: LP gas	LP gas used
North Carolina							
	Mil. lbs.	Percent	Mil. lbs.	Percent	Mil. lbs.	Pounds	Mil. gals.
Tobacco	668	100	668.0	70	467.6	5.0	93.5
Peanuts	360	80	288	95	273.6	40.6	6.7
	Mil. bus.		Mil. bus.		Mil. bus.	Bushels	
Corn	100	15	15	95	14.3	6.2	2.3
Total							102.5
South Carolina							
	Mil. lbs.	Percent	Mil. lbs.	Percent	Mil. lbs.	Pounds	Mil. gals.
Tobacco	134	75	100.5	65	65.3	5.0	13.1
Peanuts	28	80	22.4	95	21.3	49.3	0.4
	Mil. bus.	Percent	Mil. bus.	Percent	Mil bus.	Bushels	
Corn	40	18	7.2	95	6.8	6.4	1.1
Total							14.6

Broiler House Heating

ERS projects a U. S. consumption of 11,480 million pounds of ready-to-cook broilers in 1980. This represents about a 50-percent increase over the 1967-69 average of 7,868 million pounds. Production in North Carolina is expected to follow the national production trend and to maintain about the same relative position -- about 10 percent of national output. For 1980, under the above projections, production of broilers in North Carolina is calculated to be about 407 million birds, compared with 289 million in 1969.

By the same method, production in South Carolina is projected to be 30 million birds in contrast to 20 million in 1969.

Consumption of LP gas for broiler production in 1980 is expected to be about 19 million gallons in North Carolina and 1.4 million gallons in South Carolina.

Household Use -- Farm and Non-Farm

Because of the many variables related to household use, the 1980 projections do not separate volumes for farm, rural non-farm, and urban household uses.

North Carolina

Household use of LP gas for 1980 should increase in proportion to population increases. Estimated population for North Carolina in 1980 was placed over 6 million by the Federal Water Pollution Control Authority compared to nearly 5.2 million for 1969, an increase of about 16 percent. On the basis of population increase, LP gas use in all households was estimated at 81 million gallons in 1980 compared with 70 million gallons in 1969.

South Carolina

The 1980 estimates for South Carolina, as for North Carolina, was based on an increment of the same magnitude for gas as for population. The estimated population for 1980 in South Carolina was over 3 million an increase of about 16.5 percent over the figure of over 2 million for 1969. Expansion of LP gas use on the basis of population would add 8.2 million gallons to the 1969 usage of 49 million gallons, thus resulting in 57.2 million gallons of LP gas for household use in South Carolina in 1980.

Table 12.--Estimated use of LP gas in farm production and in all households, North and South Carolina, 1969 and 1980.

Use	North Carolina		South Carolina	
	1969	1980	1969	1980
	Million Gallons			
Farm production				
Crop drying				
Tobacco	56.0	93.5	7.1	13.1
Peanuts	6.4	6.7	0.3	0.4
Corn	1.7	2.3	0.3	1.1
Crop total	64.1	102.5	7.7	14.6
Broilers	11.0	19.0	0.7	1.4
Total farm production	75.1	121.5	8.4	16.0
Household				
Farm	5.5	-	4.4	-
Rural non-farm	37.0	-	28.3	-
Urban	27.8	-	16.6	-
Total household	70.3	a/ 81.0	49.3	a/57.2
Total Use	145.4	202.5	57.7	73.2

a/ Household estimates for 1980 are based on projected total population increases. Allocation among types of users was not projected.

Total Use

Total consumption of LP gas in farming and in all households in 1980 was estimated at 202.5 million gallons for North Carolina and 73.2 million gallons for South Carolina (Table 12). These were increases of 39 percent and 27 percent over 1969 use in the respective States.

Farm production use in North Carolina is expected to increase sharply--to 121.5 million gallons compared with 81 million gallons by all types of households. In South Carolina, however, farm use is projected at 16 million gallons compared with 57.2 million for all households.

Possible New Uses

In addition to the current production uses of LP gas in agriculture, emphasis on pollution control may cause a shift away from current use of insecticides and herbicides to the use of LP gas. Gas is already used to some extent for weed and pest control but its use could be expanded as pressure builds against chemicals as pollutants.

The public concern about pollution has heightened interest in a greater use of natural gas -- as liquid natural gas (LN gas). A Wall Street Journal article of February 4, 1970, outlined some current efforts to assure expanded use of natural gas by distributing it in pressureized consumer containers.

Without indicating any precise market potential, LN gas should be recognized as another petroleum competitor, particularly as a replacement for gasoline and fuel oil. Its distribution would likely be handled like that of LP gas. Hence distributors of LP gas would be prepared with facilities and distribution routes to add LN gas as a companion product to LP gas.

APPENDIX -- INFORMATION SOURCES

A -- By Agencies and Institutions

States

North Carolina

Department of Agricultural Economics, Department of Agricultural Engineering, and Agricultural Extension Service, North Carolina State University, Raleigh.

Agricultural Statistics, Federal-State Crop Reporting Service, Raleigh.

North Carolina Department of Agriculture, Raleigh

South Carolina

Crop and Livestock Reporting Service, Clemson University, Clemson.

Department of Agricultural Economics and Rural Sociology and Agricultural Extension Service, Clemson University, Clemson.

U. S. Government

Department of Agriculture, Washington, D. C.

- Economic Research Service
- Agricultural Research Service
- Extension Service
- Farmer Cooperative Service

Department of Interior

- Bureau of Mines, Washington, D. C.
- Water Pollution Control Authority, Charlottesville, Va.

Commerce Department, Washington, D. C.

- Census Bureau
- Weather Bureau

Cooperatives

Petroleum and Economic or Market Research Departments

FCX, Inc., Raleigh

Southern States Cooperative, Richmond, Va.

Farmers Union Central Exchange, St. Paul, Minn.

Farmland Industries, Inc., Kansas City, Mo.

FS Services, Inc., Bloomington, Ill.

Farmers Inc., Greenville, Miss.

Other

National LP Gas Association, Chicago, Ill. and Washington, D. C.

Southeastern LP Gas Association, Atlanta, Ga.

Research Triangle Institute, Statistics Research Division, Research Triangle Park, N. C.

Publications

Liquid Petroleum Fuel Used by Farmers in 1959 and Related Data. ERS-Prod. Economics Division, USDA - Statistical Bulletin 344. May 1964.

Crop Drying in the United States, 1966. ERS-SRS-USDA- Statistical Bulletin 439. June 1969.

LP Gas Market Facts. National LP Gas Association. Selected Years.

National LP Gas Association Cost of Doing Business Summary. National LP Gas Association. 1968.

1964 Census of Agriculture. Commerce Department.

1960 Census of Housing. Commerce Department.

B -- By Subject

Farm Production Uses

Number of farms in State
Agricultural Statistics, Federal-State Crop Reporting Service, Raleigh, and Columbia.

Percent of farms using LP gas and amount purchased for production uses.
1964 Census of Agriculture.
Economic Research Service: Liquid Petroleum Fuel. Statistical Bulletin 344. Used by farmers in 1959 and related data, May 1964.

Prices paid by farmers for LP gas
Annual Agricultural Prices. USDA

Current crop production
Agricultural Statistics. Federal-State Crop Reporting Service.

Proportion of crops dried on farms; proportion dried with LP gas; and drying rate per gallon of LP gas.

Economic Research Service. Crop Drying in the United States, 1966. Statistic Bulletin 439. June 1969
State and County Agricultural Extension Service

Current broiler production
Crop and Livestock Reporting Service, North Carolina State University, Raleigh; and Clemson University, Clemson, S. C.

Percent of broiler houses and production heated with LP gas, and rate or number heated per gallon of gas.
State and County Agricultural Extension Service

Other farm motors using LP gas and rate of use
Economic Research Service

Other farm uses (weed control) etc.
Economic Research Service
State and County Agricultural Extension Services
Department of Agricultural Engineering, State Universities

Household Uses -- Farm and Non-Farm

Number of farm, rural, non-farm, and urban households in the State
Percent of households heated with LP gas; percent using LP gas for cooking; and percent heating water with LP gas and rate of use for these purposes.

North Carolina Department of Agriculture, Raleigh, N. C.
Research Triangle Institute, Research Triangle Park, N. C.
1960 Census of Housing

Other farm and non-farm household uses
Bureau of Mines, Washington, D. C.

Projected trends in population and households -- farm and non-farm
Federal Water Pollution Control Authority, Charlottesville, Va.
Economic Research Service

All Uses

National LP Gas Association, Chicago, Illinois and Washington, D. C.
LP Gas Association Cost of Doing Business Summary, 1968

Southeastern LP Gas Association, Atlanta, Ga.

Petroleum and Economic or Market Research Departments
FCX, Inc., Raleigh, N. C.
Southern States Cooperative, Richmond, Va.
Farmers Union Central Exchange, St. Paul, Minn.
Farmland Industries, Inc., Kansas City, Mo.
FS Services, Inc., Bloomington, Ill.
Farmers, Inc., Greenville, Miss.